Project Title: Winter wheat variety evaluations with a special reference to insect infestations in the Western Triangle Region - WTARC

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Cooperators: Bradley Farms, north of Cut Bank, MT
Brian Aklestad, north of Devon, MT
Aaron Killion, east of Brady, MT
Inbody Farms, northeast of Choteau, MT

Objectives: There are diverse cropping environments within the area served by Western Triangle Agricultural Research Center. Each off station location has its own unique environment and soils. Producers in the various locations are interested in variety performance in the local area. To this end the objective is to evaluate winter wheat varieties under the local conditions with respect to yield, test weight, plant height, and seed protein. The environmental conditions at the off station nurseries can vary greatly from those at WTARC. The research center strives to provide growers of the western triangle area unbiased information of various winter wheat varieties.

Methods: Off station winter wheat nurseries consist of 24 entries replicated three times, seeded with a four row plot seeder on one foot spacing. All plots were planted on no-till chemical fallow. Plots were trimmed, measured for length, and then harvested with a Hege 140 plot combine. Winter wheat seed was cleaned prior to collecting data. The insect monitoring activity was initiated in all the entries. The plant samples were collected randomly and brought to the laboratory. The stems were cut and noticed for the diapausing stages of the larvae of the wheat stem sawfly. Orange wheat blossom midge pheromone traps were also installed at each off station plot.

Results: Off station plots were harvested at Choteau, Cut Bank, Devon, and the 'Knees'. The data are presented in Tables 1 thru 7, with soil test results presented in Table 8.

The soils were generally dry at the surface when seeding winter wheat during the fall of 2013. The precipitation in September and October was below the 28 average, with a warmer September and a cooler October.

Overall, the crop year was a little over 3 degrees cooler than the 28 year average at the research center with a little over an inch more moisture than the 28 year average. The winter, with the exception of January was cooler than usual. February was quite cold when compared to the 28 year average. The spring was quite cool with April being slightly cooler and wetter than the average.

Soil temperatures at the station under chemical fallow stubble stayed under 40 degrees at a depth of eight inches until mid April. May was cool and dry. Early in June we received 0.9 inches, then it warmed up and remained dry for about 10 days. At that time the winter wheat was running out of water as it was beginning to head. About that time we started getting significant rain for a five day span. The cool temps associated with the rain slowed the winter wheat heading.

Just as things were getting mature or close to mature the rain in August came at a very poor time. To further exacerbate the harvest situation we received snow on September 10th and 11th.

Grain yields and test weights at the 'Knees' were 2.9 bu/ac and 0.7 lb/bu higher than the four year average. Protein at the 'Knees' were equal to the four year average (Table 6 and 7). Grain yields at Devon were much higher than the four year average. Test weights at the Devon location were three and a half pounds per bushel higher than the four year average, whereas the protein was one percent lower than the four year average (Tables 4 and 5). The data for Choteau are presented in Tables 1 and 2. Yields at Choteau were 10 bu/ac higher than the three year average. The test weight was the same as the three year average, with protein being slightly lower. Plots at Cut Bank received hail as is reflected in the yield and test weight data (Table 3). There is no long term table for Cut Bank as the plot has been destroyed by hail and one spray accident the last three of 5 years.

Top yielding varieties at the Choteau location were Jagalene, Montana State University experimental lines MT 1138, and MTCS 1204 with yields being 80.0, 75.9, and 75.8 bu/ac. MT1286, MT1090, and Accipiter were the high yielding varieties at Devon at 67.9, 65.2, and 62.7 bu/ac. Top yielders at the 'Knees' include Yellowstone, Decade, and Colter at 74.1, 70.9, and 69.2 bu/a. At Cut Bank, the top yielding wheat's were all Montana State University experimental lines MT1138, MTW08168, and MTS0826-63 with yields of 80.4, 75.4, and 73.4 bu/ac.

No insect incidence (wheat stem sawfly or wireworms) was noticed in any of the winter wheat varieties. This is because of the high number of parasitoids of the wheat stem sawfly are present at the research center. None of the traps got any adults of orange wheat blossom midge at the off station locations.

Summary: The data from the off station plots is supported by the local producers and advisory committee as well as the seed industry. It is planned to continue the off station variety plots at the same locations as the environmental conditions at each location is unique to the western triangle area. No insect incidence or damage was noticed in any of the varieties.

These data should be used for comparative purposes rather than using absolute numbers. Statistics are used to indicate that treatment or variety differences are really different and are not different due to chance or error. The least significant difference (LSD) and coefficient of variability (CV) values are useful in comparing treatment or variety differences. The LSD value represents the smallest difference between two treatments at a given probably level. The LSD at p=0.05 or 5 % probability level is usually the statistic reported, and it means that the odds are 19 to 1 that treatment differences by the amount of the LSD are truly different. The CV value

measures the variability of the experiment or variety trial, and a CV greater than 15 % indicates a high degree of variability and less accuracy.

Funding Summary: Office of Special Projects will provide expenditure information. No other grants support this project.

MWBC FY2016 Grant Submission Plans: A similar project will be proposed for FY 2016. The continuation of on and off-station variety trials help elucidate researchers and farmers which varieties are better suited for that particular region in Montana.

Table 1. Off-station Winter Wheat variety trial (Exp. 3866) located east of Choteau, MT. Teton County. Western Triangle Ag. Research Center. 2014.

Variety or ID	Yield bu/ac	Test weight lb/bu	Plant height in	Protein %	Lodging %
Jagalene	80.0	63.2	35.0	14.4	12
MT1138	75.9	57.4	34.7	15.1	13
MTCS1204	75.8	61.0	36.0	14.4	8
SY Clearstone 2CL	75.5	57.8	35.3	14.6	30
Yellowstone	75.2	57.4	35.0	15.3	42
MT0978	74.3	57.6	34.3	15.3	9
Decade	73.2	60.6	33.3	14.7	2
WB3768	72.7	58.7	36.7	14.9	20
MT1078	72.6	57.7	33.7	14.3	27
MT1117	70.8	57.9	33.7	15.5	37
Colter	70.4	58.0	35.0	15.3	30
Accipiter	67.7	57.0	34.0	15.1	4
CDC Falcon	67.5	58.4	31.7	14.8	3
MT1090	67.5	56.8	35.3	15.1	22
Jerry	67.3	57.8	38.7	14.8	22
MTS1024	67.3	56.3	32.3	14.3	10
Judee	67.2	58.7	33.3	15.5	4
WB-Quake	67.1	59.2	33.7	14.9	2
Bearpaw	65.6	60.3	34.3	14.9	1
Genou	65.2	58.5	38.0	15.4	4
MT1286	64.5	58.1	30.7	14.7	60
Warhorse	64.1	58.1	32.7	14.4	1
Rampart	62.7	59.6	37.3	15.3	3
MTS0826-63	62.7	59.2	37.3	15.6	1
Mean	69.7	58.6	34.7	14.9	15.2
LSD (0.05)	8.5	1.3	1.5		15.3
C.V. (%)	7.5	1.3	2.6		61
P-value (Varieties)	0.0034	<0.0001	<0.0001		<0.0001

Cooperator and Location: Inbody Farms, Teton County.
Planted: September 20, 2013 on chem-fallow Harvested: 8/13/14
Fertilizer, actual lbs/ac: 11-22-0 applied with seed and 40-0-20 urea blended with potash were broadcast at seeding. Spring topdressing took place on 5/6/2014 with 29-0-0. For fertilizer rates a yield goal of 70 bu/ac.
Herbicide: None Precipitation: n/a. Conducted by MSU Western Triangle Ag. Research Center.

Table 2. Three-year means, Winter Wheat varieties, Choteau Area, Teton County. 2012-2014.

Variety	**	3-Year Mean			
		Yield bu/ac	Test weight	Height in.	Protein %
Yellowstone	-	57.5	57.9	31.4	15.1
Jagalene	-	57.1	61.3	29.5	14.8
Bearpaw (MTS0721)	**	53.6	59.3	29.4	15.0
CDC Falcon	-	53.0	57.7	28.7	15.0
Colter (MT08172)	-	53.0	57.7	28.7	15.0
SY Clearstone 2CL	-	52.8	58.0	31.9	15.2
Genou	**	52.4	58.9	29.0	15.2
Judee (MTS0713)	**	52.1	58.9	29.0	15.2
Decade	-	51.9	59.1	29.3	15.4
Warhorse (MTS0808)	**	49.2	57.9	28.7	15.0
Jerry	-	48.8	58.0	32.9	15.6
Accipiter	-	48.7	57.3	29.0	15.7
WB-Quake	**	48.0	58.1	28.7	15.4
Rampart	**	45.3	59.0	32.5	15.8
Mean		51.7	58.5	30.4	15.3

** = Solid stem sawfly-resistant (solid stem score of 19 or higher).
* = Less preferred by sawfly (behavioral preference) in small plots.

Cooperator and Location: Inbody Farm, Teton County.

Conducted by MSU Western Triangle Ag. Research Center.

Table 3. Off-station Winter Wheat variety trial located north of Cut Bank, MT. Glacier County. Western Triangle Ag. Research Center. 2014. Hail damaged plot.

Variety Or ID	Yield bu/ac	Test Wt. lb/bu	Height in.	Protein %
MT1138	80.4	56.5	34.3	13.6
MTW08168	75.4	56.0	35.0	13.6
MTS0826-63	73.4	56.1	35.3	14.4
Jagalene	71.9	57.2	33.3	13.4
Judee	71.1	55.6	32.0	13.5
MTS1024	70.5	52.6	30.0	13.4
Bearpaw	70.2	54.0	32.3	13.8
Yellowstone	67.6	53.9	34.3	13.7
MT1078	67.6	53.0	30.7	13.1
Accipiter	66.2	54.7	33.0	13.9
MT1090	66.1	54.8	34.3	13.6
MTCS1204	65.3	55.5	33.5	13.2
CDC Falcon	64.3	52.5	30.0	14.0
Warhorse	64.3	54.6	30.7	14.4
SY Clearstone 2CL	64.3	53.8	34.3	13.7
Decade	64.2	54.2	32.3	13.6
MT1117	64.1	55.8	34.3	13.7
Rampart	64.0	55.4	35.3	14.8
Colter	63.1	55.4	34.0	13.7
MT0978	61.4	54.6	33.3	14.1
Jerry	59.9	52.7	36.7	14.1
MT1286	57.8	54.4	33.3	13.6
WB-Quake	54.6	55.3	32.3	13.8
Genou	50.8	55.0	37.0	14.5
Mean	65.8	54.7	33.4	13.8
LSD (.05)	ns	2.0	2.2	
C.V. (%)	17.1	2.2	4.0	
P-Value	0.4910	0.0004	<0.0001	

Cooperator and Location: Bradley Farms, northern Glacier County.
Planted: 9/24/13 on chem-fallow. Harvested: 9/18/14.
Fertilizer, actual lbs/a: 11-22.5-0 with seed at planting, top dressed with 99-0-00 on 5/22/14. For fertilizer rates a yield goal of 70 bu/ac.
Sprayed with Huskie at 11 oz/ac and Axial XL at 16.4 oz/ac on 6/21/13.
Conducted by MSU Western Triangle Ag. Research Center.

Table 4. Off-station Winter Wheat Variety Trial located in the Devon area. Western Triangle Ag. Research Center. 2014.

Variety or ID	Yield bu/ac	Test Wt lb/bu	Plant Ht (in)	Protein %
MT1286	67.9	62.6	27.7	10.4
MT1090	65.2	62.8	30.3	11.2
Accipiter	62.7	63.9	28.3	10.7
Yellowstone	62.1	62.1	30.0	11.1
Colter	62.1	63.2	30.0	11.4
MT0978	61.5	62.5	25.0	11.9
WB-Quake	61.0	63.1	27.3	11.2
Decade	60.9	63.9	28.3	12.0
MT1138	60.9	62.7	29.0	11.4
MTW08168	60.5	62.8	32.0	11.4
MTS1024	59.8	60.9	25.0	10.6
MTS0826-63	58.3	62.2	29.3	11.8
MT1117	57.1	62.8	28.3	10.9
CDC Falcon	55.9	62.8	25.0	11.5
SY Clearstone 2CL	55.9	62.3	29.0	11.5
Rampart	54.7	63.3	29.3	12.4
Warhorse	53.1	62.9	26.3	11.5
MT1078	53.1	61.5	24.3	10.4
Genou	52.8	63.0	26.0	11.5
Jerry	52.7	61.8	28.0	11.8
MTCS1204	52.6	63.0	29.0	13.1
Bearpaw	51.7	63.2	23.7	12.9
Jagalene	51.3	65.0	26.0	12.5
Judee	50.1	63.5	23.7	11.9
Average	57.7	62.8	27.5	11.5
LSD (.05)	ns	1.3	2.6	
C.V.	13.5	1.3	5.8	
P-Value (0.05)	0.3159	0.0003	<0.0001	

Cooperator and Location: Brian Aklestad, Toole County.
Planted: 9/20/14 chem-fallow. Harvested: 8/6/14
Fertilizer, actual lbs/ac: 22-22-20. 11-52-0 Placed with seed while planting. Top dressed with 10-0-20 while planting. Spring topdressing took place on 5/22/14 with 29-0-0. For fertilizer rates a yield goal of 50 bu/ac.
Herbicide: None Precipitation: 3.8 inches

Table 5. Four-year means, Winter Wheat varieties, Devon area, Eastern Toole County. 2010 - 2014.

Variety	**	4-Year Mean			
		Yield bu/ac	Test weight	Height in.	Protein %
Yellowstone	-	50.7	58.4	27.2	12.5
Decade	-	50.6	60.0	27.1	12.7
WB-Quake	**	49.2	59.3	26.5	13.0
Colter (MT08172)	-	49.1	59.4	28.1	13.1
Accipiter	-	49.0	59.1	26.7	12.4
CDC Falcon	-	47.2	58.8	24.9	12.7
SY Clearstone 2CL	-	47.0	58.6	27.7	12.8
Jerry	-	46.8	58.7	27.4	12.7
Judee (MTS0713)	**	46.4	59.8	25.3	13.2
Bearpaw (MTS0712)	**	46.2	59.6	24.9	13.2
Warhorse (MTS0808)	**	45.3	59.1	26.5	13.1
Jagalene	-	44.7	60.5	26.4	12.8
Genou	**	44.7	59.6	28.0	12.9
Rampart	**	39.7	59.2	27.7	13.4
Mean		46.9	59.3	26.8	12.9

** = Solid stem sawfly-resistant (solid stem score of 19 or higher).
* = Less preferred by sawfly (behavioral preference) in small plots.

Cooperator and Location: Brian Aklestad, Eastern Toole County.

Conducted by MSU Western Triangle Ag. Research Center.

Table 6. Off-station Winter Wheat variety trial located near the Knees. Chouteau County. Western Triangle Ag. Research Center. 2014.

Variety or ID	Yield bu/ac	Test Wt. lb/bu	Height in.	Protein %
Yellowstone	74.1	60.6	29.0	12.9
Decade	70.9	62.6	29.7	14.1
Colter	69.2	60.5	29.3	13.4
MTS1024	69.0	59.0	28.0	12.6
MT1117	67.0	61.1	31.3	13.6
MT1138	66.4	60.3	29.7	13.5
WB-Quake	63.1	61.6	27.5	13.0
Accipiter	63.0	61.8	28.5	13.1
MT0978	62.9	60.6	27.0	13.2
MTCS1204	62.0	61.6	28.0	13.3
Warhorse	61.3	61.5	27.0	12.9
Judee	60.9	61.5	29.0	13.7
SY Clearstone 2CL	59.5	59.2	30.0	13.7
MT1286	59.5	59.2	29.3	13.0
MTW08168	59.3	60.9	31.3	13.1
MTS0826-63	59.0	61.3	30.3	13.9
CDC Falcon	58.2	61.4	25.0	14.0
Jerry	58.0	59.7	31.0	13.5
MT1078	58.0	59.2	26.7	13.0
Bearpaw	57.6	62.0	26.7	13.7
Rampart	57.1	60.6	28.3	13.6
MT1090	52.2	59.8	31.3	12.8
Genou	51.9	61.0	28.3	13.3
Jagalene	48.9	63.6	26.0	13.8
Mean	61.2	60.9	28.7	13.4
LSD (.05)	ns	1.8	2.1	
C.V. (%)	18.4	1.8	4.5	
P-Value	0.6361	0.0002	<0.0001	

Cooperator and Location: Aaron Killion, western Chouteau County.
Planted: 9/30/ 2013 on chem-fallow. Harvested: 8/12/14.
Fertilizer, actual lbs/ac: 11-22-0 with seed at planting, 105-0-20 broadcast while planting. Spring topdressing took place on 5/21/14 with 65-0-0. For fertilizer rates a yield goal of 70 bu/ac.
Pre-plant sprayed with Olympus @ 0.6 oz/ac on May 10/23/13
Conducted by MSU Western Triangle Ag. Research Center.

Table 7. Four-year means, Winter Wheat varieties, Knees area, western Chouteau County. 2010-2014.

Variety or ID	**	4-Year Mean			
		Yield bu/ac	Test weight lbs/bu	Height in	Protein %
Yellowstone	-	65.9	59.5	31.5	13.2
SY Clearstone 2CL	-	64.2	58.6	33.7	13.4
Colter (MT08172)	-	63.9	59.6	31.3	13.0
Warhorse (MTS0808)	**	62.9	60.3	29.7	12.8
Decade	-	61.3	60.9	30.3	13.6
WB-Quake	**	59.1	60.1	30.0	13.1
Judee (MTS0713)	**	58.8	61.1	28.8	13.6
Accipiter	-	58.2	60.5	29.6	13.3
CDC Falcon	-	58.1	60.4	28.3	13.6
Jagalene	-	54.4	62.2	29.3	13.1
Bearpaw (MTS0721)	**	53.5	60.1	28.9	13.5
Jerry	**	53.2	59.3	32.1	13.4
Genou	**	51.3	60.4	32.0	13.4
Rampart	**	51.3	60.4	31.2	13.7
Mean		58.3	60.2	30.4	13.3

** = Solid stem sawfly-resistant (solid stem score of 19 or higher).

Cooperator and Location: Aaron Killion, western Chouteau County.

Conducted by MSU Western Triangle Ag. Research Center.

Table 8. Soil test values for off-station and on-station plots, WTARC, 2014.

Location	N (lbs/ac)[1]	Olsen-P (ppm)	K (ppm)	pH	OM (%)	EC (mmhos/cm)
Cut Bank	54.6	18	394	7.9	2.4	0.44
Devon	11.9	18	408	6.6	1.0	0.18
Choteau	26.5	11	550	8.0	2.7	0.62
WTARC	17.6	18	346	7.5	2.7	0.38

[1]Nitrogen soil samples were to a depth of four feet in one foot increments. All other soil tests were for zero to six inches in depth.
WTARC- Western Triangle Ag. Research Center